Cleanroom M.O.T.

Brendon McManus, Commercial Director of Clean Air Technologies explains the importance of maintaining your cleanroom

Having just experienced the problem of a company vehicle failing its annual M.O.T., our attention focused on aspects of cost, inconvenience and the inevitable issues of safety. We had the car regularly serviced so why did it fail? The garage admitted to only checking the items they were contracted to do and not to looking at the car as a whole. The schedule of service tasks had subsequently not taken into account the rigours endured from UK roads and the resulting wear and tear on the rear suspension of heavy test equipment in the boot.

I was drawn to an analogy of running a car and my business of servicing cleanrooms.

Typically, cleanroom operators implement validation tasks, such as particle counts, HEPA filter installations leak tests on a regular basis to assess and ensure airborne particle counts meets certain designated standards. These routine service tasks relate solely to the air quality in a controlled environment.

However, can it be said that equal consideration is given to the condition and operation of the mechanical and electrical components that work together to ensure the cleanroom performs to its operational specification?

This is where a measured, monitored and methodical approach is critical to the sure and effective operation of a cleanroom. Moreover, as with a car M.O.T., do you know what to expect despite best efforts endeavoured?

Our company ensures the highest of operational procedures in all aspects of air movement plant equipment. These procedures include meticulous levels of maintenance and ongoing performance testing. We liaise with the client to provide detailed analysis - such as that of a cleanroom M.O.T. checklist. Implementation by our current clients has proven to minimise cleanroom downtime, increase plant longevity and alert the cleanroom operator in advance to plant deterioration and to budget for future replacement.

Measuring particle counts in the Arrows Formula 1 trailer

Additionally, operators are provided with a datum for future benchmarking of cleanroom performance when assessing the implications of system modifications and any concurrent operational changes.

Below is a list of recommendations gained through experience and the conversion of sound business theories and principles into working practice.

Cleanroom components

Air handling unit:

"A drive belt broke in the air handling unit resulting in the loss of air pressure in my cleanroom and four hours downtime while I sourced a replacement belt at a cost of £12 for the belt and thousand of pounds in lost production."

- Change pre-filters, ensure, fitted correctly with air by pass. – spare filters to be kept in stock
- Change fan drive belts, align pulleys and tension correctly, leave spare belt in air handling unit
- Clean and biocide heating and cooling coils
- Clean and biocide condense tray and trap, ensuring condense runs freely and no stagnant areas.
- Measure and record the fan motor running amps to ensure phases in balance and motor winding not failing.
- Change humidifier bottle and clean strainers
- Have all heating and cooling plant services checked by approved HVAC operator

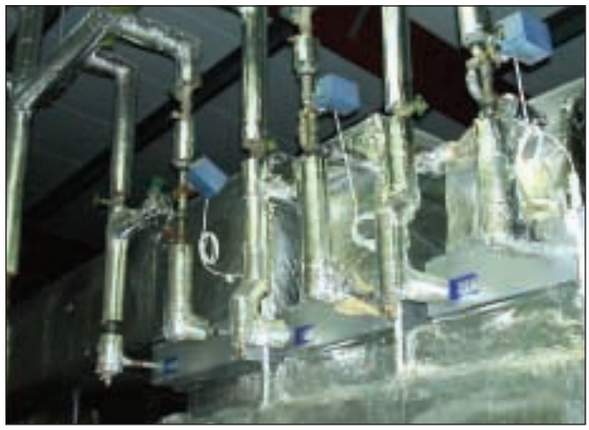
Air movement system

"We lost pressure gradually in our room, the belts and the filters seemed fine, it was not until I was in the car park to leave, did I notice the autumn leaves blocking the air intake grille. Next day, I removed the leaves and the pressures returned"

- Clean fresh air intake of any debris
- Measure and record the proportion of

Typical cleanroom air movement system

CAT Engineer measuring electrical energy consumption of air movement system



Reheat coils with associated pipework and controls

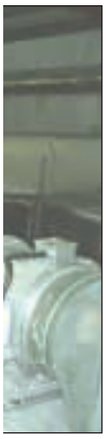
fresh air to recirculated air and compare to original design

- Measure and record airflow volumes at all test points and compare to original data
- Measure and record the pressure differentials across each individual component for a comparison to manufacturers data
- Inspect ductwork for leakage and damage
- Inspect lagging of ductwork and re-fix where necessary
- Lubricate all dampers then rotate through full movement, re-securing in original position

Energy usage (CO_2 emissions)

"By modifying our air conditioning control system by fitting a time switch to control temperature only during periods of occupancy, we paid for the modification in three months in reduced energy consumption with the added benefit of reduced wear and tear. "

- Measure and record switch on/off time for temperature and humidity control. Then compare against operating hours
- Record night set back temperatures
- Measure and record inverter settings on each fan motor
- Have environmental controls serviced by HVAC approved contractor
- Note and record overload setting on all breakers
- Check condition of fuses and associated electrical wiring
- Check operation of actuators and valves through the temperature and humidity control range
- Record filter type, dimensions, and pressures. Is it technologically up to date?
- Newer, advanced filters provide more energy efficiency
- Investigate fitting of filters



Fabric and structural checks

" We had an HSE inspection and the inspector checked that our emergency lights and door interlock were tested regularly and results recorded"

- Inspect all structural supports for condition and security
- Check ceiling panels for damage during maintenance
- Inspect all wall panels, doors, and record any damage
- Inspect condition and operation of doors, interlocks, hinges and door closures. Results to be recorded
- Inspect condition and operation of all emergency exits and crash bars
- Inspect condition of floor, all weldings and joints. Defects to be noted
- Inspect condition of all seals and mastic jointings. Record defects
- Check operation of all lights and emergency lights

Cleanroom performance

"We found that through investment in training of our cleanroom personnel we received an tangible benefit, as we found our daily particle counts improved immediately"

- Particle counts to be taken with:
  Cleanroom in non-operational state
  Cleanroom with no personnel present, but equipment in operation
  Cleanroom in full operational mode
- This will facilitate future benchmarking for operational improvements
- Hepa installation leak test
- Measure and record air change rates in each area
- Measure and record light levels at the working plane. To be compared to specification for visual activity
- Measure and record noise levels in both the unmanned and operational states
- Measure and record pressure differentials between each room
- Measure and record the cleanroom area cleanup rate; recovery time will be a function of airflow distribution pattern and volume of the filtered air. It is also an excellent indicator of efficiency of the air supply system.

Conclusion

'Prevention is better than failure'

Modern day cleanroom managers need to strictly control their budget, and make informed decisions. These can only be made with all the facts.

Accurate monitoring and recording of all strategic component's performance will allow effective cleanroom management utilising the data as the cleanroom key performance indicators.

A non-informed manager will only know they have a cleanroom performance problem on component failure, with the ensuing downtime and costs while the fault is identified and then rectified or when there is a increase in product failure, with the related decrease in profitability warranty costs and loss of reputation

The above checks are beneficial to all operators ensuring less downtime, the planning of future upgrades or repairs to the area or air-handling units.

They also allow you the operator to know and understand your cleanroom. Also ensuring that when Clean Air Technologies Ltd and other specialists come to call you will know and understand both what is happening and why it is beneficial to you.

To finish the analogy: Your cleanroom may be regularly serviced but would it pass its Clean Air Technologies M.O.T.??

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